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SIGMA XI QUARTERLY

VOL. 24

MARCH, 1936

No. 1

SEMI-CENTENNIAL, ITHACA, JUNE 19-20, 1936

JOINT MEETING WITH A. A. A. S.
ROCHESTER, JUNE 16-18



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LIGON ON SCIENCE, CHARACTER AND CHURCH

THE PROCEEDINGS OF THE 36TH CONVENTION

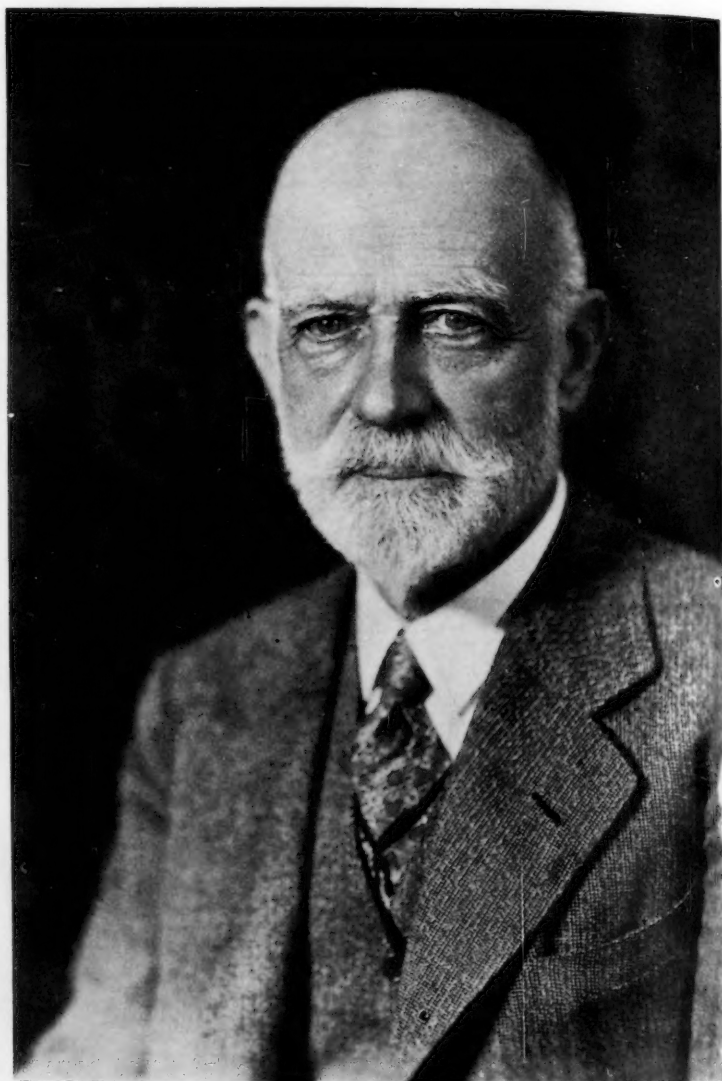
CIRCULATION THIS ISSUE OVER 12,000

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DR. W. F. DURAND

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GREETING TO THE MEMBERS OF SIGMA XI

This year marks the completion of the first half century of the life of Sigma Xi; and it is not too much to claim that it has exercised, during that period, an ever-increasing and stimulating influence on the scientific life of our country, and especially in the field of education in science.

Of the members of the original Cornell Chapter in 1886, ten in number, six are still living, while four have passed on. To those still with us, a special personal greeting. It must be to you a source of peculiar and deep satisfaction that you have been permitted to have a part in the organization of the Society of Sigma Xi, and to witness and share in its growth to the position of influence which it now occupies.

And could those who have gone before have lived to see this day and the present growth of the Society with its sixty-six chapters and some twelve thousand active members, would it not be to them likewise a source of profound satisfaction that the lone chapter of 1886, their child, had, in these years grown to so large a stature and that its guiding spirit has become so influential a factor in the advance of science and its appreciation in the service of man.

With the close of the first half century, now is the time to look forward to the second half and to make a firm resolve that, so far as our own lives may reach into the next fifty-year period, and in so far as in us may lie, the growth of the Society and the character of its influence on the scientific life of our country shall continue, unflinching, unwavering, on an ever-ascending gradient of progress.

W. F. DURAND.

THE SEMI-CENTENNIAL

This important event is a part of the summer meetings of the A. A. A. S. scheduled to be held in Rochester and Ithaca, June 16-20.

THE ITHACA PROGRAM

Friday Afternoon, June 19

- a. Greetings from Cornell University.
- b. Greetings from the A. A. A. S., President Conklin.
- c. Response from the President of Sigma Xi, Dr. W. F. Durand.
- d. A brief history of Sigma Xi, Edward Ellery.
- e. Address: The Service of Sigma Xi in the Universities of the Future. Dr. Karl T. Compton, President of the Massachusetts Institute of Technology.

Friday Evening, June 19

- a. The Semi-centennial Dinner.
- b. Address: Scientific Research and the Social Order, Present and Future, Dr. Max Mason, President, The Rockefeller Foundation.

Saturday Morning, June 20

- a. Presentation of the Semi-Centennial Prizes.
- b. Address: Accomplishments and the Future of the Physical Sciences. Dr. Willis R. Whitney, Vice-President of the General Electric Company, in charge of Research.
- c. Address: Accomplishments and the Future of the Biological Sciences. Prof. Frank R. Lillie, University of Chicago.
- d. Unveiling of the Semi-Centennial Memorial Tablet.

ACCOMMODATIONS AT ITHACA

Accommodations during the Semi-Centennial celebration at Ithaca will be available in the residential halls of Cornell University for members of Sigma Xi, members of the American Association for the Advancement of Science, and others attending the event. The residential halls will be open for Thursday night, June 18, and may be occupied until Sunday forenoon, June 21. Meals may be obtained in Willard Straight Hall on the campus.

All who plan to be present at the Semi-Centennial should obtain room assignments in advance by writing to Prof. C. C. Murdock, Rockefeller Hall, Cornell University, Ithaca, N. Y., specifying the number and names of persons for whom accommodations are desired, and the approximate time of arrival and departure.

The charge for rooms will be \$2.00 per person per night or \$5.00 per person for three nights.

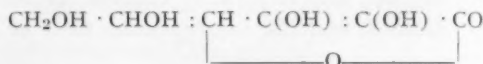
CHEMICAL NATURE OF THE VITAMINS

WALTER C. RUSSELL

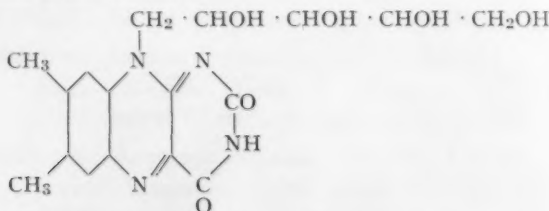
Rutgers University and the New Jersey Agricultural
Experiment Station

Space limitation permits a brief treatment of only one phase of vitamin investigation and the writer has elected to review our present knowledge of the chemical nature of the vitamins. The isolation and analysis of a physiologically active substance, and the synthesis of a compound whose physiological properties are identical with the naturally occurring substance are the criteria which must be observed in establishing the chemical nature of the vitamins.

Vitamin C was the first of these substances whose chemical formula was completely established. In 1928 at Cambridge University Szent-Györgyi obtained a hexuronic acid from the adrenal cortex, oranges and cabbage as an oxidation-reduction factor, but did not associate the product with vitamin C. King, of the University of Pittsburgh, in 1932 isolated from lemon juice a hexuronic acid which showed antiscorbutic properties. Almost simultaneously Szent-Györgyi reported the same finding for his compound. In the hands of a group of English workers headed by Hirst and Haworth the structure of the compound was established in 1933 and its synthesis was announced by Reichstein (Switzerland) in the same year. The l-form was found to have antiscorbutic activity to that of the natural product. The formula for the compound, l-ascorbic acid, is

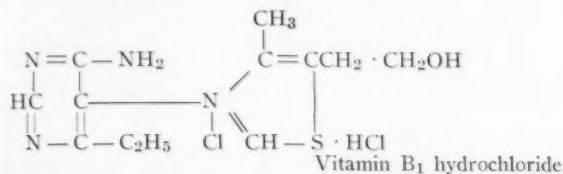


Kuhn (Germany), 1933, presented evidence that vitamin B₂, the pellagra-preventive factor, is a flavine but more recently results to the contrary have been reported by Elvehjem (University of Wisconsin) and other investigators. The structure of certain of the flavines has been established and their synthesis accomplished. Karrer (Switzerland) and Kuhn (Germany), 1935, reported the synthesis of lactoflavin.



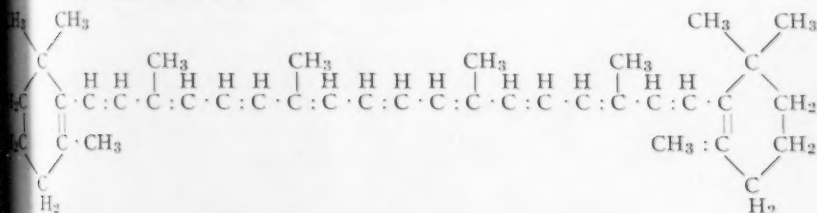
The natural and the synthetic products show growth-promoting properties but apparently do not prevent pellagra. It is possible that the original B₂ factor consists of a growth-promoting and a pellagra-preventing factor to which the flavines contribute the growth-promoting property.

Isolation of a crystalline product of high vitamin B₁ potency from rice polish by Williams and associates (Columbia) and a series of chemical studies by the same investigators has led to the proposal (1935) of the following structure for the B₁ factor, the anti-beri-beri vitamin.



Synthesis of this vitamin remains yet to be accomplished. Windaus in Germany has also isolated a crystalline vitamin B₁ and has conducted similar studies. Other factors of the vitamin B complex have been reported but as yet none of these has been isolated.

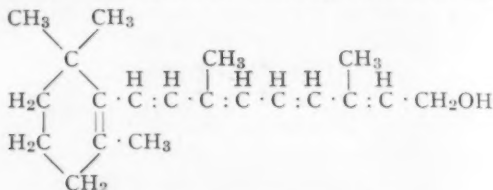
The discovery of von Euler (Sweden) in 1928 that the plant pigment carotene possesses vitamin A properties and the demonstration by Moore (England) in 1929 of the conversion of this pigment by certain species into the form of vitamin A present in fish liver oils gave a marked impetus to the study of the chemistry of this factor. The pigment was first isolated by Wackenroder in 1831 but renewed interest in carotene, on account of its physiological activity, led to the simultaneous discovery in 1931 of alpha and beta forms by Kuhn (Germany), Karrer (Switzerland), and Rosenheim (England). In 1933 Kuhn reported a gamma form and Winterstein (Germany) a delta form. Due to the work of Karrer and of Kuhn and their associates the formula for beta carotene has been established as



Formulas for the alpha and gamma forms are of the same type.

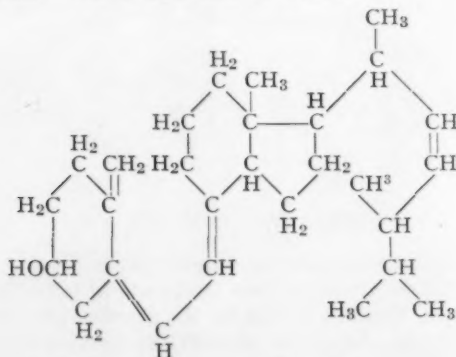
Kuhn has reported the activity of beta carotene to be twice that of alpha or gamma carotene which furnishes a basis for the postulate that one molecule of the beta form would give rise to two molecules of the vitamin present in fish liver oils. Furthermore there is evidence that a beta-ionone ring (the rings in beta carotene) in combination with four conjugated double bands accounts for vitamin A activity. Karrer and associates (1933) have formed perhydrovitamin A by the hydrogenation of a vitamin A preparation from certain fish liver oils and have synthesized a compound which is identical with it. Neither of these compounds possesses vitamin A activity, however. A close relationship between carotene and the preparation from fish liver oils is revealed by the fact that

both yield geronic acid upon ozonization. Upon the basis of these and other observations, Karrer has proposed the following formula for vitamin A:



Theoretically this compound could be formed by the splitting of beta carotene at the middle double band of the connecting chain, with the addition of water. The carotene isomers or vitamin A have not been synthesized.

In 1924, Hess (Columbia) and Steenbock (Wisconsin) discovered almost simultaneously that certain substances could be made antirachitically active by ultraviolet radiation. Intensive work led to the finding in 1927 by Hess and Windaus that the sterol, ergosterol, when exposed to ultraviolet radiation gave rise to a highly potent antirachitic product. In 1931 four different laboratories announced almost simultaneously the separation of crystalline preparations of an antirachitic factor from the products of the irradiation of ergosterol. Two of the laboratories were in England, one in Germany and one in Holland. The product was given the name calciferol by the English investigators. The fundamental work of Rosenheim and King (England) on the chemistry of the sterols has permitted rapid advances in the chemistry of calciferol. Heilbron and associates (England) and Windaus (Germany) proposed similar formulas for this compound. The configuration of Windaus is



Vitamin D has not been isolated from natural sources, such as the fish liver oils, and until this is done it will not be possible to determine the relation of the synthetic product, calciferol, to the naturally occurring form.

Evans and associates (California) reported in 1935 the preparation of a crystalline product from wheat germ oil of very high vitamin E, anti-sterility properties. Preliminary chemical studies suggest a complex higher alcohol.

PERSPECTIVES IN RESEARCH*

OLIVER JUSTIN LEE

"There is a desire, common to all men, to want to know."

So spoke the great philosopher

Aristotle of Stageiros.

This is the truest answer

To the questions often asked of men of science—

Why do you study rays or stones or stars?

Why did up the mounts in Illinois or Iran?

Why investigate the genes and chromosomes

Or search the states of matter and

Dynamics of the distant galaxies?

The words "I want to know" are graven deeper

In the psychic structure of mankind

Than any other urge save that "to eat."

It flourishes before the thought of sex

Has come to haunt and thrill and vex—

It spurs the adolescent, drives a man at prime

Of life, and stays to fascinate the old

When fires of life are spent and growing cold.

The will to know is deep and primitive—

It is a mighty current in the human race

Which cannot be deflected from its course

By fear or hunger, bribe or force.

To eat and know are first—the fundamental tones

Of life, and all about them set we

Overtones and harmonies of physical desires,

Love of beauty, love of power, love of play

From early morn of life until the end of day.

A dangerous anemia has made men say,

"Why do research? Why publish papers endlessly

About so many searches after truth.

Is't not vanity that drives a man to write

And set his name above the story

Of his quest?" We grant at once,

There *are* too many books, too many words are writ

To sell, that add not e'en a little bit

To solid knowledge.

* Address given before the Society of Sigma Xi at Northwestern University, November 15, 1935.

All this is but a picture negative, reversed—
 The lights are black, the shadows bright.
 It is as Satan—let us turn to God, the positive,
 The Will to Know, a deeply rooted urge to learn.

The layman says and really feels that a scientist is a man who knows more and more about less and less. To him it is axiomatic that the specialist both cannot and does not develop a sense of Perspective. Without stopping to criticize the layman's own perspective, which is often an ephemeral concoction brewed by hearsay, immediate necessity, political or economical expediency and hasty analysis of current, undigested elements of knowledge, we may say that he is right in one respect and for this reason. The scientist is so much concerned with truth and analytic rigor that the layman's perspective does not command his respect. And, of course, if an intelligent man sets truth above expediency in formulating his outlook upon the human scene the result will not be conventional or comfortable to himself and others. This refers to the ordinary back-yard variety of perspectives, which are distinctly myopic.

The perspectives I want to discuss are of a different character. They are concerned with processes and accomplishments of research in all the past of man's mental history, the present and in the long future. On the safe premise that man is inquisitive, like most of his more humble brothers in the animal world, and wants to know, what can we say specifically about his objectives of knowledge and what are the prospects that he will ever attain to them.

For such a group as this, in which every person is dedicated to the search for truth and the increase of knowledge, and has, in reality, pledged his body and spirit and career to the quest, these matters are of paramount importance. What is the knowledge, what are the convictions, what are the reasoned expectations that underlie his activities in research? Is the whole idea of attaining more complete and more perfect knowledge of the universe a chimaera, an absurd and groundless fancy because of some metaphysical or demoniacal barrier which must forever prevent fulfillment of the dreams and hopes and activating often unspoken desires of men who do research? Is it evidence of a diseased and degenerate stage in the evolutionary process which has come on because man is outgrowing the crude biologic satisfactions of eating, sleeping, breeding, fighting and dying and has turned to the more subtle and exotic pleasures of mental activity? Or, is it joyous, exhilarating game which is being played by the negative consent of, and under the blind eyes of the tremendous impersonal forces of nature, which must in the long run wipe out completely every bit of evidence that man has ever lived and loved and played the game of learning. Regardless of what type of rationalization you may prefer, the fact remains that man wants to know.

I return now to the objectives of knowledge and the prospects of attaining them and shall, on the way, indulge myself in making a classification, with which you may or may not agree, without affecting the argument that follows.

Fields of research are so numerous, and narrow, and broad, and related that it is not easy to characterize them in general terms. The tremendous

prestige which the words SCIENCE and SCIENTIFIC have earned in the past has led men to use them in innumerable connections where they do not belong. Fields of investigation of all kinds, which are just beginning to emerge from the general flux of human thinking and activity, have suddenly, as it were overnight, put on a borrowed "front" by being called sciences or scientific. In most of these cases not even has one of the three tests been met which we usually say define a science. These three are:

First: Can objective and impersonal methods of research be applied?

Second: Has a technique been developed which leads to quantitative results which are expressible in accepted units; and, are the conclusions verifiable by prediction and observation?

Third: Does the field possess a body of well defined laws which describe the nature and relations of the phenomena observed in that field?

Such considerations will, I admit, be taken into account in the attempt at a classification which follows.

Let us say that any investigation which deals directly with some phase or phenomenon of nature itself is fundamental research. This is broad enough to include studies of stars and atoms, living tissue and all functional processes in which objective methods are possible.

Into a class which we may designate as secondary research must go attempts at utilizing and making available, for the benefit of mankind, the consequences of any fact or law which fundamental research has disclosed. It is of course almost an every day experience that a man who is engaged upon this secondary kind of research hits upon something which is of a fundamental nature and usually now, when so many first-class investigators have gone into industrial laboratories, this man himself is able and interested enough to conclude the matter and enrich fundamental science by his discovery. Fortunately it is not necessary for us to adjudge whether the work belongs in the first or the second class, or both. Our proper reaction is to rejoice that a new and significant addition has been made to basic knowledge.

Since we are just now engaged in classifying, let us create a third or tertiary class for investigations that deal with materials which have passed through the distorting, misleading filter of human experience with humanity itself. Such materials belong to a quite different category from those we have considered so far. Not only is the material itself conditioned by a host of known and unknown influences that have operated to produce the experience which is recorded—biases, complexes, even PSYCHOSES and the semi-necessary distortions of actions and opinions due to human selfishness—but the very statements of conclusions are subjective and can seldom be expressed in unambiguous units and terms. It is claimed that the conditions in men's social, economic and political life are not reproducible and that therefore individual action cannot be predicted, and such studies now usually confine themselves to statistics about actions that are past. This is probably true at present and will be for some time to come, but I can see no inherent reason why human relationships cannot some time in the future be studied with scientific rigor.

There are a host of human reactions that can be predicted with a high degree of accuracy even in individual cases. Scholarly men might, in the study of individuals in a given group, use the device which is so constantly employed in the sciences, the device of isolating one variable after another and evaluating its size or strength in standard units. We know the technique will be difficult, but so it is in the sciences, where often much more effort is spent upon developing a way of getting at the problem than is afterwards given to answering the question itself.

As things now stand we are compelled to place such investigations in the third class.

Historical, archeological and literary researches comprise a fourth class.

This attempt at classifying is based upon the nature of the material with which one works, the technique employed and the character of the results.

There can be no question about placing direct research of nature herself in the first and by far the most important place. The facts and relations of facts, which fundamental research has yielded through the ages, almost bear the stamp of the eternal. All the other types of investigation, which have been mentioned, rarely reveal anything which has this quality of agelessness. In consequence, the order in which they are named is not important except that research in applying fundamental facts of nature in the industries really belongs where we have put it—in the second place.

All this is not to be interpreted as disparagement of attempts to study human relationships. Even a child can see the need of such efforts in a world which is forever getting out of joint and in which individuals all about us and we ourselves are often poorly adjusted to environment.

In the sciences, facts, when analyzed and related, lead to rules and laws, and when prediction has been repeatedly fulfilled by subsequent events the cycle is complete. In social studies there exists an enormous volume of facts, cases and personal opinions about them. There exists also a considerable body of generalization, or if you prefer, rationalization, but specific prediction is rarely indulged in except by the very wise and the very foolish. In this case the cycle of investigation is not complete until motivation is induced and a given course of thought or action takes place.

May I say—and I do so with real humility—that as a human being living in a troubled world, I care little for the endless fact finding of our students of contemporary life and I am consumed with thirst for inspirational pictures, ideal plans and spiritual charts by which the necessary modifications of our social order may be guided. Most people are sensitive to the appeal of the romantic and the idealistic; it is a grateful escape from the choking realism of every-day life. More than that—it satisfies a spiritual need.

Many earnest students of social phenomena, especially in academic circles, frankly say that such matters are not their concern. I cannot help thinking that it *IS* their concern; and furthermore I believe that such a broadened scope for these investigators would rather quickly lead to methods of predicting and verifying which might even after a time make such fields scientific, if not sciences.

Having incidentally paid my respectful respects to nonscientific fields of investigation with almost a prayer that the leaders in these fields may have the vision and the courage to teach into our minds a body of ideals for a rational and happy future development of civilization, I return to a further consideration of the personal philosophy of a scientist and to the ambitions which underlie research.

Recalling again the motif, which was stressed in the opening part of this address that the desire to know is common to all mankind, let me advisedly say that I think this desire has absolutely no bounds or limits.

Man wants to know the extent of the whole physical universe; whether it is infinite or finite in size; how it came to be; when it started and how, and when it is going to end. Why else is he seeking out the structure of atomic matter in laboratory and in stars, and building larger and larger telescopes to sound the incredible reaches of space.

He wants to know the origin of life, its development and destiny, the extent of its occurrence and the variety of its form and texture in all the universe. Why else study the primitive cell, the functional characteristics of its astonishing complexities in all living things? Why else try to originate life from chemical elements and radiation, or analyze the atmospheres of planets and check the results with the conditions for life as we know them on earth? The question, "What evidence is there of life on celestial bodies other than the earth?" is asked of astronomers by Thomas, Richard and Harrison of the general public more frequently than any other one question.

Man wants to know the secret of how mind, soul, personality started, why they started, where they are located in a body and the physical relation of these elusive entities to the chemical elements and processes in a living organism. Why else do pathologists and neurologists isolate one feature of mentality after another and try to establish its connections with physical units or functions in living matter. That they are succeeding is dramatically demonstrated when by the simple injection of specific sera not only can bodily dimensions be changed but personality itself can be profoundly modified, perhaps even to the extent of making normal again a victim of dementia praecox. What is the reason in terms of physics and chemistry for loving some people and disliking others in the multitudinous cases occurring in which the erotic or sexual element is positively not present?

What is the physical reason for our willingness to pay money to hear an opera, a symphony, to see or own a painting or travel long distances to get the view of land and sea from a mountain top? We are no richer, healthier or wiser than before having had these experiences. But do we not sense a new balance, a finer worth, a deeper peace within ourselves because of them? Does this response come from electro-chemical reactions within our bodies? If so, they can be studied and measured.

Are there any physical reasons in terms of nerves and brain and blood and their functioning why all mankind has, in general, an inextinguishable desire to prolong or continue the existence of personality after the body dies and is resolved into its primitive chemical elements?

These are all questions which do not alone arise in the mind of the scientist and the philosopher who is looking for research problems. They all lie very close to the surface, to a weaker or a stronger degree, in the minds of all men.

The brutish or unthinking person may say, "Why worry about such things? You can never find the answer anyhow, and are only wasting your own time and energy; and you are annoying the rest of us by pretending that you can make such questions the subject of investigation." All the recorded intellectual history of mankind repudiates such an attitude. Man wants to know.

I have tried to point out that science is, at this very moment, engaged more earnestly upon investigating matters pertaining finally to the solution of almost all of these questions than ever it has been in the previous history of mankind.

As serious investigators, we may now in a group ask ourselves, "What are the chances of ever finding definitive answers to these and similar questions?"

Before asking you members and friends of the Society of Sigma Xi, to look into your own minds to see what you think the prospects are in your own field, let us take a look at the time perspective which is involved. In regard to the field of astronomy, the oldest of the sciences, the erudite Forest Ray Moulton remarks, "We are like a person who has heard one tick of the cosmical clock and is trying to reconstruct in his mind the whole mechanism of the clock." This is true. Even the three or more thousand years of astronomical observation and deduction is like one second in the lifetime of the universe. Mathematics is about coeval with astronomy. It is often said that physics began with Galileo. Description of living organisms began in ancient times, but correct fundamental deductions are only a few centuries old at most. This is also roughly true in chemistry and geology. It is seen that Moulton's simile is quite a propos, if we apply it to science as a whole.

Would you be willing to say that just because you do not understand the whole mechanism of a fine clock after having heard it tick just once, you despair of ever being able to understand it completely? "Absurd," you would say, "just give me time."

The whole intellectual history of man up to the present moment teaches one thing at least, which is, that it is simply foolish to set up any arbitrary limits to the possibilities of man's understanding of the universe. It is not a question of using a constant velocity in thinking of our progress in such understanding—probably not even a question of a constant acceleration. If by some means we could set down as empirical numbers the second differences with respect to time we should undoubtedly find for suitable intervals in the last two or three centuries *not a constant*, which would indicate ordinary acceleration, but a series of increasing numbers indicating an increase in this acceleration itself. To what lengths such tendencies can carry us in, for example, the next ten thousand years cannot be estimated. Every day brings forth surprising discoveries and basic conclusions.

The layman often says, "Before long all scientists will be crazy, if this goes." I see no indications of this. Every real investigator of nature whom I know seems perfectly normal except for those personal idiosyncrasies which stand out in an occasional man of genius in any walk of life. The long, rigor-

ous training of a scientist does not attract unstable mentalities. A deep, constructive enthusiasm for his work may set a man apart from his fellows, but this tends to fortify rather than unseat his reason.

In what follows I shall have to beg your indulgence for being quite personal. I appeal to the experiences most of us have had by growing up with brothers and sisters. Was any other device ever invented which so persistently tended to take unadjustable corners out of our personalities and to reestablish psychological equilibria as the frank give and take discussions, the small quarrels, the deep affections in the family group?

Election to membership in this Society should be and usually is conditioned by very simple rules. Does the candidate show initiative and judgment in analyzing the known contents in a specific field of knowledge and in formulating his own research problem? Does he have that penetrating quality of mind which enables him to reason his way out of or through difficulties encountered in his investigations? Does he have enough automotive energy to finish the work? Does he love the truth above all else, and has he the manly humility to criticize his own work even harder than others are likely to do it for him?

It is a common experience that a person who does not, in his undergraduate and graduate days, show many or all of the characteristics just described may get his higher degrees in science, but the chances are strong that he will thereafter lapse into inactivity as an investigator and follow the path of least resistance into administrative work or teaching. Without meaning in any way to depreciate these activities there is obviously a definite loss to be recorded for the progress of knowledge when this happens, as it often does. Anyone, like us, who deals with knowledge and professes it as a teacher, misses the finest edge, the keenest satisfaction of an intellectual career unless he does research. He is like an anaemic person who has to depend upon transfusions alone, instead of generating good red blood by basic intellectual metabolism in his own system.

Let me mention another angle of this matter. Men in business and students of business alike admit that "You do not have to be especially brainy to make money." I am quoting this statement. All you need to do is to earnestly want to make money and then to apply yourself completely with all your heart and all your force to realize your wish.

May I recall to your minds a parable spoken by that Master of spiritual insight, Jesus—the parable of the talents. Those men who were given five and two talents increased them greatly by judicious investment. The one who had received only one talent (about \$1,500 to \$2,000) buried his money in the ground and when he reported what he had done even the one talent of money was taken from him and he was cast out.

The illumination thrown upon our argument is clear, whether we apply the parable in the direct or the inverse sense. The history of the sciences abounds in cases of men who were much less than geniuses, but whose passion for truth and devotion to research led them to discoveries that are immortal. You can easily supply the names in your own field, as I can in astronomy.

There can be no doubt that world civilization has passed through only its early, largely chaotic stages. Even a simple minded reader of history and observer of the unsettled, the unreasonable state of current affairs will recognize this as a fact. But we are prone to think that the case of intellectual life is different—that it has very nearly run through all its possible stages and types of activity. Using a crude figure, we may say that intellectual life is a dynamic processing machine of the most exquisite and versatile type, into which is continually fed an endless variety of mental raw material in the shape of observations, impressions, feelings and their reactions with all that man has found and thought and concluded in the past. If we consider the aggregate output of this process up to the present we must conclude that it has only just begun. Lest any youthful person here should think that this is not so; that we have arrived at a fairly complete state of knowledge, let him look toward all the facts and relations which are met missing in his own field. Then let him look into the mirror of the last few decades, or centuries, and he will know, even at this moment, that they can be learned. Look at all the facts and relations which are missing in your own field, and which we even now know can be learned. The word youthful obviously characterizes our status in this respect, also. Keeping in mind the astonishing record of man's achievement in understanding the universe, even in his childhood as it were, can anyone doubt that his adolescence and adulthood will be glorious and satisfying beyond our wildest dreams? We have inherited much and our course lies clearly before us if we do our part in shaping the intellectual destiny of our race, with a passion for truth and singleness of purpose.

Although our specific part in the great plan is to increase knowledge, we also pray, as members of a world community, that with knowledge and understanding may come wisdom, which is the third element in what we believe is an indissoluble trinity.

Words have marvelous qualities. In the volatile fluid of speech or writing, words stand out as whirlpools or mountain peaks in the ocean. Single words or short phrases haunt us for years. They inspire, soothe, condemn, praise, drive, lead, obstruct, immortalize the human spirit.

I close this brief address by recalling to your minds a few of the beautiful, towering words which we inevitably associate with research—imagination, theory, proof, accuracy, relationship, law, equilibrium, evidence—faith, humility, vision, truth and fidelity.

THE CHURCH IN THE SCIENTIFIC STUDY OF CHARACTER

ERNEST M. LIGON

Union College

Four propositions seem self-evident. The discovery of the laws governing the formation and development of character constitutes one of the major problems of psychology. Thus far relatively few significant quantitative contributions have been made to the solution of this problem. Obviously such contributions will not be made until the bewildering complexity of its factors can be subjected to experiment and quantitative measurement. Certain major obstacles to the performance of such experiments and measurements have not yet been overcome in psychology. It is the thesis of this paper that the possibility for such research is latent in religion, especially in its program of religious education, not only because of the dedication of that institution to character development, but because of certain other characteristics which are unique among the so-called character building agencies.

In the history of educational psychology, one method has been found far more useful than any other; namely, the experimental-control group method. Thus, if one wishes to ascertain the value of a given principle of child training, he subjects one group of children to this training. Both before and after this training period, the group is measured in the trait concerned, to discover whether the expected effects have been secured. Another group of children, who have not had this training must also be measured, to be certain that any observed effects in the first group are due to the training and not to other causes. It seems improbable that we shall discover the laws governing the development of character until theories of character education can be tested by the same procedure. Parents, however, are slow to offer their children to such important experiments. Yet, it is true that we are not likely to make scientific progress until such experimental and control groups can be formed. So long as the subjects of character research investigations cannot be subjected completely to the training theory, studies of character must necessarily be superficial in character. Thus, most of the previous investigations, which have measured the effect of religious training on children in such traits as honesty, were handicapped by the vagueness of and the conflict between the types of character education which the child received at home and in the church school. It is, however, with respect to this very feature of the problem that religion provides the only obvious opportunity for a genuinely scientific investigation.

Every religion has implicit in it a basic theory of character education. It follows, therefore, that a group of children being subjected to any single type of religious education is in the very nature of the case an experimental group. A comparison between it and the rest of the population forms the basis for a fundamental experiment in the psychology of character. It may be contended

that such experiments have been done. Hartshorne and May, Hightower and others have made such comparisons with respect to such characteristics as honesty, coöperativeness and the like. Such studies have regularly given negative results. As judged by them, the effect of religious education in the functions measured is negligible. It is not the intention of the author to deny the validity of these studies. They are very significant, and demonstrate clearly the inefficiency of current methods of religious education. It is the belief of the author, however, that no thoroughgoing experiment to test the validity of religious teachings about character has ever been made. This is as much due to the inefficiency of religious education as to lack of scientific study.

A comprehensive experiment of this sort would involve four fundamental features: (1) Definable and measurable, (2) Measurement, (3) A psychologically valid program of character development, (4) A recognition of individual differences in character training. Such an investigation is now being undertaken through the coöperation of the Union College Laboratory of Psychology and the Westminster Presbyterian Church of Albany, New York. The basis principle being employed in this research will illustrate these four points.

I. INDEFINABLE AND MEASURABLE GOALS

Not the least important reason for the failure of religious education to bring about effective results in those subjected to it is the vagueness of its goals. In earlier periods of its history, when its program was that of negative ethics and its chief motivation fear of eternal punishment, its effect on men's lives was obvious and far-reaching. When its goal was that of memorizing religious information, its results were still clear-cut and effective. But when social progress made the fear motivation ineffective and negative ethics impossible as an ideal, and when it became obvious that the acquiring of religious information was no guarantee of moral behavior, goals became confused and vague.

A generation ago the effort to bring about agreement among religious leaders as to the goals of religious education would have been impossible. That same conditions would prevail today except for certain recent developments which are influencing thought in every realm. The first is the growing conviction that the scientific method is the most fruitful one yet devised. Men are becoming increasingly willing to abandon complete dependence upon the process of logic and place more emphasis upon the method of experiment. It seems certain that religious leaders would never reach agreement if they waited for logical argument to bring about that agreement. It seems equally certain that we shall not determine the validity of any religious teachings about character until some tentative hypothesis is adopted and used experimentally in character education. If religious leaders will adopt some definite measurable goals, and build a program of religious education around them, measuring carefully the results at every point, we shall soon be making fundamental discoveries about the nature and development of character.

Obviously the choice of these experimental goals is no simple task. In the laboratory, one may subject a group of white rats to any sort of training he

chooses, however improbable of beneficial results and however carelessly planned. But children are not white rats. No parents will wish to subject them to such an experiment. Furthermore, adherents of any one religion have faith in the validity of that religion, and will not agree to subjecting their children to any training which is not in accord with that religion. The chosen goals then must satisfy several conditions, if we hope for either their adoption or success. The author has spent a number of years constructing such a theory of personality and character development for the Christian religion.¹ The criteria and methods by which this was done will illustrate these conditions.

The fundamental condition underlying this theory is that it shall use the knowledge already available in religion and psychology to give it the greatest possible promise of success. In the first place, it was developed to be strictly Christian. Christian people have faith that the teachings of Jesus represent universal spiritual law. The traits chosen constitute interpretations of the Beatitudes. Most of the results of New Testament scholarship were examined in making these interpretations. It seems probable, therefore, that the traits set forth in the above mentioned volume are legitimate interpretations of the teachings of Jesus. It is obvious to anyone acquainted with the literature in this field that New Testament scholars, even of the first rank, are far from agreed as to the interpretation of many of Jesus' teachings. Another criterion, therefore, was used for selecting between conflicting interpretations for any given teaching: namely, its psychological validity. There are many high-flown theories of character and personality in the literature of psychology and psychiatry. Many of them are almost totally without substantiating evidence. Parents may well have a justifiable scepticism concerning them until they are far better established than they are at present. But out of the vast experience of the ages, plus the rapidly growing body of quantitative data about human behavior, certain principles emerge which can be accepted as fundamentally sound. In no field of psychology is the doctrine of parsimony so badly needed as in the building of theories of character and personality. When, however, one has brought together all of the fundamental discoveries of abnormal psychology, mental hygiene, psychiatry, educational psychology, and child psychology, a fairly respectable body of dependable principles can be set forth concerning character and personality. When, therefore, one of Jesus' teachings could be interpreted in more than one way, that way was chosen which was in accord with the best we know about mental hygiene and wholesome personality. In the next place, the chosen traits of character must be ethically sound. Examining these, one finds a remarkable lack of negative ethics. The ancient virtues are not there by name. For example, no trait of character has been so much studied as honesty. Honesty is not present in this list of traits, although the experience of the ages has thoroughly demonstrated the value of this virtue in social institutions. However, if the list of traits is examined, it will be clear that one characterized by them would have the most wholesome sort of integrity. Furthermore, the old negative virtues were difficult to define, difficult to establish, and in need of all sorts of exceptions. They were negative and generally not conducive to wholesome mental life. These proposed traits, then, are not letting go of anything of value in the older ethics,

but establishing positive traits which have their values without their defects. Finally, the chosen traits must be definable and measurable. Psychologists are not agreed as to whether there is such a thing as a generalized trait. Most of them believe that a trait is simply the characteristic name applied to a group of habits formed by the individual. The author is in accord with this view. But whether this group of habits ever becomes a generalized trait or not, at least all are agreed that the formation of traits is brought about by forming many reaction pattern habits in line with the trait in question. The goals to be used in this investigation are adaptable to this sort of development. It is believed, then, that the chosen goals are Christian, mentally wholesome, and ethically sound. Some may feel that they do not constitute an exhaustive list and that others should be added to them, but it seems improbable that anyone will wish to subtract from them, if he is an adherent of the Christian religion. It is reasonable to hope, therefore, that churches will adopt them as the basis for their programs of religious education with the confidence that they will show every promise of being wholesome and valuable in the life of the child.

A full description of these traits has been made elsewhere.² They are subsumed under two major groups of four each. The first group consists of the traits of "Experimental Faith," the second group the traits of "Fatherly Love." Few will deny the value of faith and love in human life, nor will they deny the harm of their opposites, fear and anger. The difficulty has been in defining faith and love in terms of specific and wholesome characteristics. The nature of the faith set forth in this theory is what may be called experimental faith, which has something of the quality of the spirit of the scientist in his implicit confidence in the lawfulness of the universe. By fatherly love is meant, the parental attitude, which has been shown to be so generally powerful and wholesome in individuals and society. The more exact definition of "Experimental Faith" is found in the statement of the four traits of which it consists. The first one is "vision," the mental habit of always looking for better things and greater achievements. The second is "love of righteousness," the mental habits of always wanting to know more, both in learning information and in eagerness to discover ways of bringing about human happiness and success. The third is "faith in the friendliness of the universe," which includes the scientist's faith in the lawfulness of the universe, plus the Christian conviction that this lawfulness is distinctly friendly toward mankind. The fourth is "dominating purpose in the service of mankind." The value of purpose in mental health is undisputed. That this purpose is more healthy when it is socially oriented is likewise admitted by most students of personality. The four characteristic traits of "Fatherly Love" are also in accord with the best thinking in mental hygiene, as well as obviously Christian in their nature. The first is "sensitiveness to the needs of others." The parental nature of this trait is apparent, as well as its mental wholesomeness. It has been elicited in the child experimentally as early as eighteen months of age. The second is "the desire to give every man his chance at happiness and success." This is the mental attitude of what is usually called genuine sportsmanship. Its parental nature is also easily seen. The third is "the desire to resolve the conflicts within men and between men." When one considers the ravages of fear and

anger in society and in the lives of men, he can see the value of this mental attitude, when it characterizes the behavior of an individual. The fourth of the characteristics of "Fatherly Love" is "the determination to serve men whether they want to be served or not." It is easy to see how often this mental attitude finds expression in the lives of parents. It is also obvious that it is one of the outstanding characteristics of great men of all times. When one considers again the dangers of anger and vanity in human personality, the character value of this trait is also obvious. As has been mentioned, these traits constitute careful interpretations of the Beatitudes as well as being mentally wholesome. They seem to constitute a reasonable goal for programs of religious education in the effort to develop strong character and wholesome personality. They are the goals toward which this investigation is aimed.

II. MEASUREMENT

The history of science indicates that the value of research varies directly with the accuracy of measurements. Non-quantitative investigations, as a rule, have not been very fruitful, except insofar as they have been preliminary studies to more rigorous quantitative work. It has happened regularly that each progressive refinement in measuring instruments has revealed experimental phenomena which were imperceptible to the grosser measurements.

When one approaches the field of personality and character, he finds the problem of measurement a difficult one indeed. It is only when one has recognized the many possible errors that beset an experimenter in this field, and become aware of the many methods necessary to develop accurate measuring devices, that he appreciates the difficulties. The excellent volume by Symonds² is one of the best of the works now written to help the inexperienced worker to do his task well.

As has been stated, the experimental-control group method is the only one which has been especially fruitful in the study of any sort of educational methods. Character education seems to demand the same careful study. Having selected goals, it is necessary to find measuring instruments by which to determine the status of an individual toward those goals at any time. Thus by successive measurements, progress can be detected. Simultaneous measurement of a control group makes possible the detection of character changes which may be ascribed to any particular system of training. The ability to detect small differences and to refine methods accurately will depend, of course, upon the exactness of the measuring devices.

There are a great many existing scales for measuring traits of character and personality. People generally are somewhat sceptical of their validity. Such scepticism is a justifiable and healthy guard against careless work. Every precaution needs to be taken to insure the reliability and validity of these tests. In actual work with character education, at least three definite precautions seem reasonable requirements for scientific work. In the first place, the tests should be shown to be reliable both by the method of the correlation of halves and the correlation of successive administrations. In the second place, the tests should be shown to be valid by the method of correlation

with samples of known excellence and known deficiency in the trait measured. In the third place, every trait should be measured by at least two different measuring scales, using the results with confidence only when the two measurements agree. When such precautions are taken, the number of available measuring rods which can be used in the psychology of character and personality is small indeed. That such accurate measuring instruments are conspicuously few in psychology is obvious. The fact remains that we need such measuring rods badly, and will not find them without intensive and extensive research.

To say that such measurement is now in religious education is to overlook the value of some excellent work. Watson⁴ has listed in his volume a number of measuring devices which are of value to the religious educator. A critical summary of the work in the field of the measurement of character and personality is found in Jones⁵ splendid chapter in the *Handbook of Child Psychology*. Finally, the great work of the Character Education Inquiry, under the leadership of Hartshorne and May, constitutes the most extensive research yet done in this field. This has been reported in three volumes.⁶

In addition to the fact that religious education is dedicated to a particular theory of character education, there is another reason for the use of the church school in the scientific study of character. This relates to the troublesome sampling error. When psychologists seek large groups of children as subjects for an experiment, they usually go into the public schools. For certain types of experiment this is an invaluable source. But as one ascends the age scale, the public school sample becomes increasingly selected. A college group is so highly selected as to be impossible for use as a sampling of the general population. In the large church school, on the other hand, some factors of selection undoubtedly do enter in, but they are not so extensive as in the public schools. Therefore, the value of the church school as a normal sample becomes increasingly great with increasing age. At the college age level it affords almost the only easily available sample of subjects. In a recent experiment, the author measured certain basic attitudes in the lower age groups of the Westminster Church school and found evidences that no appreciable amount of selectivity characterizes this sample.⁷ Furthermore, the data were gathered within the space of a single church school session of two hours. This was made possible by the use of about twenty experimenters.

It seems reasonable to conclude, therefore, that we need more and more exact measurement in the field of the psychology of character, and that the church school constitutes a highly desirable means for attaining this end. That this will contribute as much to the church school as to the growth of scientific knowledge is obvious. Most programs of religious education have been based on traditional methods and theories of character and character education, the only criterion of success being the size of the membership. To know just what changes are being made in the personalities of its children, and to refine its methods in the light of such information, is the only hope of the church school in achieving its major purpose, the development of character.

This Union-Westminster investigation offers the opportunity for securing much needed data of another sort in the study of personality. There is great

need in psychology for psychogenic norms establish by following the same individuals over a period of several years. In this investigation all subjects are to be measured each year over a period of years to establish such norms.

III. A PSYCHOLOGICALLY VALID PROGRAM

It is true indeed that one cannot change human nature. Any program of training which is not constructed in the light of the actual nature of the child is doomed to failure. One may select goals which are characteristic of strong personality, but unless development toward those goals is brought about in the growing and developing nature of the individual, wholesome results are not probable. Human nature cannot be changed, but it can be directed.

Modern education is keenly aware of and sensitive to this condition. In the more progressive public and private schools every advance in the knowledge of the nature of the growing individual is utilized in the building of educational curricula. The more progressive church schools are doing the same thing, usually under the guidance of educational experts. The value of such curricula cannot be overemphasized in a scientific program of character development.

The author, with the active assistance of Miss Dorothy Fritz, director of religious education of the Westminster Presbyterian Church, Albany, N. Y., and Rev. Kenneth B. Welles, pastor of the same church, has constructed a psychogenic chart.⁸ This chart describes in outline form the major characteristics of the principal developmental stages from infancy to adolescence, and for each of the eight traits to be developed it outlines for each age the habits to be formed at that age toward the ultimate development of the trait. For example, in infancy, namely, the first three years, no effort is made to develop the abstract principles which constitute the matured traits, but rather to lay the foundations upon which these traits can be developed later. Thus, if the child's random manipulation of objects is rich in variety and generally happy, and if he makes social contacts easily, it is believed that he is laying the foundation for most of the traits described. This same principle is followed throughout. A parental type of behavior can be elicited as early as eighteen months of age. Every effort is made to stimulate this instinctive tendency throughout the character training period, making the conditions for its expression increasingly complex as the child's mental development makes this possible.

Inasmuch as this project is one in a developing science, it is probable that many changes will be made in this program. Such changes, however, will be made on the basis of experimental evidence, not on arm-chair theory. It is clear that we cannot hope to utilize all of the potentialities of human personality until we learn to build our programs of training on the inherited nature of the child.

IV. INDIVIDUAL DIFFERENCES

The fourth characteristic of a scientific program of character study is the recognition of individual differences. Failure to recognize these differences

has been responsible for more destruction of personality power than any other single cause. The effort to force all people into the same mould and judge them by the same standards is characteristic of most of our social institutions. "It takes all kinds of people to make a world and they are all here." This is one of the items of common sense, but a most neglected one.

It is obvious, of course, that this common sense statement of the principle of individual differences is about as accurate as the statement that "All that goes up must come down," is, of the intricate laws of gravitation. Everyone knows that people differ. What everyone does not know is that they differ in a regular and predictable way, which can be described by a mathematical formula and represented by a definite curve.

In general, character education theories, like most other educational programs, have been built for the average individual. Since very few individuals are average in all of their abilities, such a program probably fits few, if any. This means that a new type of program needs to be developed which may be called the "drama program." That is, the program must include rôles for different types of individuals. For example, if a drawing project is under way, those who are highly endowed with drawing ability are the ones who must be put in the leading rôles. If the project involves music, those with musical talent should lead. Drama programs provide opportunities for each individual to express his own special aptitudes. No traits of character can be developed in an individual except on the foundation of his own inherited drives and abilities. No educational program can develop the strongest possible personality in an individual, which leaves out of consideration any of his native endowment. A character education program of this sort, then, tries to fulfill these conditions.

This does not mean that standardized programs in religious education are impossible. They are not. Individuals differ widely, but groups differ very little. As has been said, the distribution of individual differences in a given function is so regular that any normal group will contain a normal variety of individuals with respect to that function. Programs which are constructed on the assumption of a normal distribution of individual differences will be found adapted to almost any group. Just as the cast of a play can be filled in any group of actors, so will character education projects fit all groups.

It will be seen that the application of this principle in the scientific study of character involves the measurement of the different abilities of individuals. To build programs using differing amounts of mechanical ability is useless unless we can ascertain the amount of this ability possessed by those involved in the program. This calls for the use of accurate measuring rods for special aptitudes.

The great progress in child psychology during the last two decades makes this possible in a surprising extent. Goodenough and Anderson⁹ have described a number of the methods which have been developed for the accurate study of children's abilities. In the Union College laboratory more than a score of such abilities can be measured with considerable accuracy. These include: intelligence, physical growth, motor coördination, ability to acquire complex skills, problem solving ability, visual and auditory acuity, memory and learning

ability, language ability, emotional stability, art aptitude, musical aptitude, and mechanical aptitude. This laboratory is being especially equipped for the study of character. It is made possible through the financial coöperation of the Westminster Church. If the reliability of psychological tests is questioned, it needs only to be pointed out that they are vastly superior to common sense. In a recent questionnaire investigation conducted by the author, parents showed an astonishing lack of knowledge of the nature of their children. If parents, in the most intimate contact with their children, do not know them, it should be obvious that no one else can without objective methods of measurement.

CONCLUSION

Here, then, is the nature of a scientific program for the study of the psychology of character. Definite goals, rigid measurement, psychological validity, in line with individual differences—these are the necessary qualifications if the results can be expected to yield valuable knowledge of the laws of character and personality. Religion, because of its very nature, affords through its channels of religious education the best possible approach to such a study. A program planned and built with the most painstaking care, in the light of the teachings of religion, the experience of past religious education endeavors, and the known principles of the psychology, of personality, should yield much significant data on this very important subject. After the foundation work has been finished, the specific problems will be made the subject of graduate investigations, both on the psychological nature of the curricular materials and methods, and on the more technical problems of testing and individual differences. Through this type of coöperation between progressive churches and laboratories of psychology, can the scientific method contribute its quota to the psychology of character.

REFERENCES

- ¹ Ligon, E. M., *The Psychology of Christian Personality*, The Macmillan Company, N. Y., 1935.
- ² *Loc. cit.*, chaps. II and III.
- ³ Symonds, P. M., *Diagnosing Personality and Conduct*, The Century Company, N. Y., 1927.
- ⁴ Watson, G. B., *Experimentation and Measurement in Religious Education*, Association Press, N. Y., 1927.
- ⁵ Jones, Vernon, "Children's Morals," *Handbook of Child Psychology* (second edition revised), Clark University Press, Worcester, Mass., 1933, pp. 482-533.
- ⁶ Hartshorne, H. and May, M. A., *Studies in Deceit*, The Macmillan Company, N. Y., 1927.
- ⁷ Hartshorne, H., May, M. A., and Maller, S. B., *Studies in Service and Self-Control*, The Macmillan Company, N. Y., 1929.
- ⁸ Hartshorne, H., May, M. A. and Shuttleworth, F. K., *Studies in the Organization of Character*, The Macmillan Company, N. Y., 1930.
- ⁹ Ligon, E. M., "Measuring Attitudes in a Large Church School" (to be published).
- ¹⁰ Ligon, E. M., *Developing the Christian Personality*, a psychogenic chart, The Westminster Presbyterian Church, Albany, N. Y., 1935.
- ¹¹ Goodenough, F. L. and Anderson, J. E., *Experimental Child Study*, The Appleton-Century Company, N. Y., 1933.



ROSS AIKEN GORTNER

THE NEW OFFICERS

Dr. W. F. Durand, the newly elected president of Sigma Xi, was born in Connecticut and had his preliminary education at the United States Naval Academy. His professorial experience includes Michigan State College, Cornell University, and Leland Stanford University. He has been connected with the National Advisory Commission for Aeronautics, the National Research Council, and the Guggenheim Fund for the Promotion of Aeronautics. He is a member of the National Academy and many engineering societies. He has written and published works on hydrodynamics, thermodynamics, aerodynamics, resistance and propulsion of ships, performance of the screw propeller and air propellers. He was a member of the Executive Committee of Sigma Xi from 1925 to 1930.

Ross Aiken Gortner was elected by the St. Louis Convention as a member of the Executive Committee for the five-year term ending in 1941. Professor Gortner was born in Nebraska and received his bachelor's degree in science from the Nebraska Wesleyan University. He has been connected with the University of Minnesota since 1914, as associate professor of soil chemistry, and of biochemistry, and as professor and chief of the division of agricultural biochemistry. He has served the National Research Council and the International Commission on biochemical nomenclature. Professor Gortner is an authority in biochemistry and published in 1929 "Outlines of Biochemistry." He has been a prominent figure in the activities of the Minnesota Chapter of Sigma Xi, which for the past nine years has conducted a series of public lectures on timely scientific topics for the benefit of a large public.

MINUTES OF THE MEETING OF THE EXECUTIVE
COMMITTEE OF SIGMA XI, ST. LOUIS,
DECEMBER 31, 1935

The second meeting of the Executive Committee for 1935 was held in the Hotel Jefferson, St. Louis, December 31, 1935. Those present were: President Parker, Secretary Ellery, Treasurer Pegram, Professor Stadler, Professor Miller, Dr. Louis B. Wilson, and Doctor Utley. Business was transacted as follows:

1. FORMAL PRINTED PETITIONS FOR A CHARTER FOR A CHAPTER:

University of Buffalo.

At the spring meeting of the committee, held in Washington, April 24, 1935, it was voted to request the group of petitioners at the University of Buffalo to present a formal printed petition for a charter for a chapter for consideration of the committee at some later date; and the secretary was instructed to provide the members of the committee with copies of the printed petition in advance of the December meeting, and to secure the vote of the committee by mail in order that the petition might be distributed to chapters prior to the convention. By this mail ballot, it was

VOTED: That the formal printed petition for a charter for a chapter be presented to the convention with recommendation for favorable action.

2. INFORMAL PETITIONS FOR CHARTERS FOR CHAPTERS:

a. State College of Oregon.

At a previous meeting of the committee, detailed information regarding the work in science at this institution was given prolonged study, as was also the closely related subject of the science situation at the University of Oregon. The committee voted that action be postponed until further information could be obtained regarding the newly organized educational plan in Oregon and the probable effect of it on the science work at both the University and the State College. Much additional information was obtained by the secretary through correspondence with many individuals, through the findings of a special committee of the A. A. U. P. appointed to survey the educational conditions in Oregon, and through personal conference with Chancellor Hunter, who had accepted the position as the head of the system of higher education in the state since the spring meeting of the Executive Committee. All this accumulated information was presented to the committee for consideration. After full discussion, it was

VOTED: That President Parker appoint official visitors to make a survey of the State College of Oregon, for report at the next meeting of the committee; and that the secretary be instructed to secure the opinion of neighboring chapters regarding the possible organization of a chapter at the State College of Oregon.

(Subsequent to the meeting President Parker appointed as such visitors Professor Leuschner and Professor Parker.)

b. The Carnegie Institute of Technology, Pittsburgh.

c. The University of Utah.

At the spring meeting of the committee, the secretary was instructed to transmit to the members of the committee a month before the December meeting detailed information about the resources and equipment and science work at these two institutions, in order that the committee should be able to take appropriate action when it met. As a result of this procedure, it was

VOTED: That President Parker appoint official visitors to make a survey of the conditions at these two institutions for report at a subsequent meeting; and further, that the secretary be instructed to secure from chapters located near these institutions the chapter opinion regarding a possible organization of a chapter at the Carnegie Institute and the University of Utah.

(Subsequent to the meeting President Parker appointed as such official visitors:

a. Carnegie Institute—Professor Pegram.

b. University of Utah—Professor Parker.)

d. Rice Institute.

e. Massachusetts State College.

The secretary reported that following the spring meeting groups at Rice Institute and Massachusetts State College had submitted detailed information about the resources and equipment and science work of their respective institutions, with the request that the committee give the material consideration with a view of a possible later petition for a charter for a chapter. It was

VOTED: That the secretary transmit this information to the members of the committee one month prior to the next meeting, to enable the committee to take appropriate action at that time.

h. George Washington University.

At a meeting of the Executive Committee in Chicago, June 21, 1933, official visitors to George Washington University presented a report and it was voted that while the situation at the institution was promising, further action in a petition for a charter for a chapter should be postponed to some later date.

The secretary presented additional information about the progress of the institution, and it was

VOTED: That President Parker appoint an official visitor to make a second survey of the institution.

(Subsequent to the meeting President Parker appointed Professor Pegram and Dean Richtmyer as such visitors.)

3. SPECIAL REQUEST FROM TEXAS TECHNOLOGICAL COLLEGE:

The secretary presented a request from a member of the faculty at Texas Technological College that Sigma Xi send a representative to the institution to study conditions there with the purpose of making recommendations to the faculty and administration regarding a program of developing and expanding the science work. It was

VOTED: That the secretary be instructed to inform the writer that Sigma Xi appoints official visitors to institutions only as a part of its regular procedure in the matter of organizing chapters; and then only after the Executive Committee has had opportunity to give intimate study to detailed information about the institution previously presented by the administration and faculty group; that a request for advice in formulating a program of development and expansion from the president of the institution to the National Research Council, the Carnegie Foundation, or similar organizations, would doubtless be given careful and sympathetic consideration.

4. SIGMA XI LECTURES AND PUBLICATIONS:

At the spring meeting a proposal was discussed that the society should conduct each year before the chapters a series of lectures on specific science topics, and that these lectures be published in book form. The proposal was referred to a committee consisting of Professor Stadler, Doctor Wilson and Secretary Ellery, for study and report. The committee reported as follows:

"The proposal referred to the committee was briefly as follows:

' . . . that the Sigma Xi sponsor the publication each year of a book on some scientific subject of general interest. This would consist of chapters or sections by a number of authorities eminent in the field covered. The contributions would be independent, but the topics would be so chosen as to form a coherent treatment of the general subject. . . . A competent editorial board would be authorized to select each year the general subject to be treated and the lecturers to be invited. . . . Each contributor would be expected to present his lecture before a limited number of chapters, in a tour to be scheduled within a period specified by him, and to present an appropriate version for publication. A substantial honorarium would be paid for the lectures, and any royalties on the book in excess of the expenses of the plan should be paid to the authors. . . . The list of speakers and their subjects would be announced at the beginning of the academic year, and each chapter would be free to request as few or as many of the speakers as it wished.'

The objects of the plan are (1) to aid the chapters in strengthening their local programs, and (2) to contribute soundly to the current popular literature of science.

The committee favors the adoption of this plan if it may be carried out at reasonable cost. We do not believe the Society should commit itself to

the publication of the lectures in book form without more definite information as to the possible cost of publication. We believe that publication of a book of this sort could be arranged without cost to the Society, and possibly with some profit to be applied to the cost of the lecture plan, but this cannot positively be determined until the manuscript is in hand.

The committee therefore recommends (1) that the plan be adopted for 1936-37, without commitment as to the publication of the lecture volume, (2) that a committee on lectures be appointed with authority to select the lecturers, investigate possibilities of publication, and in general to carry out the plan with such modifications as it may consider desirable, (3) that an expenditure of not more than \$900 during the fiscal year be authorized as the contribution of the national organization to the honoraria and travel expenses of the lecturers, the remainder to be paid by the chapters before which the lectures are presented."

It was

VOTED: That the report be approved and adopted; and that President Parker appoint a committee of three to serve as special lecture board. (To the members of the Executive Committee: While the secretary should not be a voting member of this lecture board, his office should serve as the bureau through which arrangements should be made with chapters for delivering these lectures. The secretary therefore suggests that he be a non-voting attache of the lecture board.)

(Subsequent to the meeting President Parker appointed as such Lecture Board: Professor Stadler, chairman; Dr. L. B. Wilson, and Prof. Kirtley F. Mather of Harvard University.)

5. OFFICERS' REPORTS FOR THE YEAR 1935:

The reports of the president, secretary and treasurer were given to the committee. They were later read to the convention, and are printed in full in the convention proceedings.

In connection with the treasurer's report, it was

VOTED: To present to the Convention the following resolution with recommendation for favorable action:

RESOLVED: That the annual assessment on each chapter for 1936 shall be payable on January 1, 1936, and that the amount of the assessment on each chapter shall be 75 cents multiplied by the number of members and associates of the chapter on January 1, 1936.

RESOLVED FURTHER: That in sending notice of the 1936 assessment to chapter treasurers, the Treasurer of the Society be instructed to advise each chapter that the assessment is to be computed strictly on the basis of the number of members and associates on the membership roll of the chapter, without regard to whether said members have or have not paid current chapter dues, and to explain that this method of fixing the amount of the assessment on each chapter has been

adopted by the conventions of the Society as the most equitable to all chapters.

6. REPORT OF THE SEMI-CENTENNIAL COMMITTEE:

This committee was asked to prepare a list of learned societies which should be invited to send representatives to the Semi-centennial, and to formulate a special invitation to be sent to the founders and to such societies. It was

VOTED: To accept the generous offer of the A. A. S. Press Service to assist the Society in distributing to the press of the country the detailed accounts of the Semi-centennial celebration and the addresses of the program.

It was also

VOTED: That the sum of \$400 be appropriated for the Friday evening address of the Semi-centennial program, and that the Society underwrite the expense of that part of the program to the extent of \$800.

(Since the convention, it has been found that this expenditure will not be necessary.)

7. THE SEMI-CENTENNIAL FUND FOR PROMOTION OF RESEARCH:

It was

VOTED: To ask the Alumni Committee to prepare and issue a letter to be sent to every Sigma Xi member and associate, soliciting contributions to the Semi-centennial Research Fund.

This vote was accompanied by the suggestion that the letter include a statement that a minimum sum (to be fixed by the committee) will ensure to the contributor a copy of the Semi-centennial Record and History.

8. CHAPTER NOMINATIONS OF NEW MEMBERS AND ASSOCIATES:

The secretary presented a letter from Professor Bogert, president of the District of Columbia Chapter, recommending a consideration of the method of making chapter nominations and suggesting the possibility of creating a national committee on admission to secure greater uniformity of standard of election.

The secretary was instructed to call Professor Bogert's attention to the constitutional provision for elections (National Constitution, Article IV), and to the eligibility requirements for members and associates as defined in the National Constitution, Article III, sections 3 and 4; and further, to refer to an action taken by the Executive Committee at its meeting in Washington, April 25, 1932, to the effect that "in the judgment of the committee it is not desirable to define eligibility in too great detail, and that in view of many differences in local conditions at various institutions where chapters exist, exact uniformity of standards for election is probably not possible."

9. ADDITIONAL SIZES OF THE SOCIETY'S EMBLEM:

The secretary presented an inquiry from the Minnesota Chapter regarding the possibility of carrying in stock an additional size of emblem intermediate between the present sizes No. 2 and No. 3. It was

VOTED: That in view of the present government restrictions on the sale and use of gold and the consequent difficulty in securing a sufficient amount of gold to carry in stock any considerable supply of emblems, it is not wise at this time to increase the number of different sizes of the insignia of the Society.

10. CERTIFICATES IN COMMENDATION OF RESEARCH:

The president included in his report the statement of the committee of award of the Society's certificates in commendation of research. The engrossed certificates bearing the signature of the national president and secretary were exhibited to the committee and later to the convention.

11. THE GRANTS-IN-AID OF RESEARCH:

The report of the committee of award of the Sigma Xi grants-in-aid was presented in the September issue of the *QUARTERLY*.

12. DIPLOMAS FOR MEMBERS AND ASSOCIATES:

At the spring meeting of the committee the secretary was authorized to improve the quality of paper used in the diplomas for members and associates, if such improvement did not involve a large increase in cost. The secretary showed the improved style printed on a smooth Japanese parchment, and stated the new diplomas could be issued to chapters at a cost of 10 cents each instead of 9 cents, the price of those in current use.

13. THE FINANCIAL ADVISORY COMMITTEE:

At the request of the treasurer, the Executive Committee at the spring meeting authorized the president to appoint a Financial Advisory Committee to assist the treasurer in the investment of the Society's permanent funds. The president announced the following committee: Gano Dunn, Roger B. Williams, Jr., and H. DeWitt Smith, all of New York, N. Y.

14. ADDITIONAL CABINET FOR THE SOCIETY'S RECORDS:

The secretary reported that all existing cabinets for filing the Society's records were now completely filled, and that there was an overflow of such records stored loosely on open shelves in the Society's quarters. It was

VOTED: To purchase an additional fire-proof cabinet at an expense of \$120.

15. CLERICAL ASSISTANCE IN THE SECRETARY'S OFFICE:

In view of the large increase in the demands on the secretary's office due to the additional work involved in the preparation of material for the Half Century Record and History, and to the growth of the Society, it

VOTED: To authorize the secretary to engage such additional clerical assistance as the circumstances warrant.

16. UNFINISHED ITEMS OF BUSINESS:

Owing to lack of time, action could not be taken on sundry items of business. The secretary was instructed to transact such business by correspondence with the committee early in January.

- a. Date and place of the spring meeting.
- b. The Memorial Semi-centennial Tablet.

EDWARD ELLERY, *Secretary*.

PROCEEDINGS OF THE THIRTY-SIXTH CONVENTION OF SIGMA XI

The Thirty-sixth Convention of the Society of the Sigma Xi was held in the Hotel Jefferson, St. Louis, December 31, 1935.

1. CALL TO ORDER:

The business session was called to order at 4.00 p.m. by the president, Prof. George Howard Parker of Harvard University.

2. COMMITTEE ON CREDENTIALS:

President Parker announced a Committee on Credentials as follows:

John W. Scott, Wyoming, chairman,
Vernon Young, Syracuse,
Nathan Fasten, Oregon State College.

3. REPORT OF COMMITTEE ON CREDENTIALS:

The Committee received the credentials of the delegates and reported fifty-two chapters and twelve clubs represented, as follows:

a. *Chapters represented and recorded as voting:*

Cornell	Michigan	Purdue
Rensselaer	Illinois	Washington
Union	Case	University
Kansas	Indiana	District of
Minnesota	Missouri	Columbia
Nebraska	Colorado	Texas
Ohio State	Wisconsin	Mayo
Pennsylvania	University of	North Carolina
Stanford	Washington	Iowa State
Columbia	Worcester	Rutgers

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Kentucky	College of Medi-	Harvard
Idaho	cine, U. of	Western Reserve
Swarthmore	Illinois	Duke
Oregon	Pennsylvania	California at Los
Virginia	State	Angeles
New York	Oklahoma	Massachusetts
Michigan State	State College of	Institute of
Maryland	Washington	Technology
Kansas State	Wyoming	Tulane
	Rochester	Wesleyan
	Pittsburgh	Smith

[Syracuse was reported as present but was not recorded as voting.]

b. Chapters which had reported appointment of delegates, but was not recorded as voting:

Northwestern	Cincinnati	Arizona
North Dakota	California	Princeton
Johns Hopkins	Institute of	
	Technology	

c. Chapters not reporting appointment of delegates, and not recorded as voting:

Yale	Iowa	McGill
Brown	California	Lehigh
	Chicago	

d. Clubs represented (twelve):

Carleton College	St. Louis	Texas Techno-
Oregon State	Georgia	logical College
Florida	Buffalo	Massachusetts
California at	Oklahoma A.	State
Davis	and M.	Ohio
Utah		

e. Officers present:

President Parker, Secretary Ellery, Treasurer Pegram, Professor Stadler, Professor Miller, Dr. L. B. Wilson, and Doctor Utley.

(The secretary appends to the minutes the following report of attendance at last five conventions:

	Chapters present and voting	Total number chapters	Clubs present	Total number of Clubs
1930	41	57	13	29
1931	43	58	12	28
1932	32	60	9	32
1933	34	62	6	31
1934	46	64	6	32
1935	52	66	12	36

4. MINUTES OF THE THIRTY-FIFTH CONVENTION:

The account of the proceedings of the Thirty-fifth Convention of the Society at Pittsburgh, December 28, 1934, published in the March (1935) issue of the *QUARTERLY*, was approved as printed.

5. REPORT OF THE PRESIDENT:

See page 41, this issue.

6. REPORT OF THE SECRETARY:

See page 45, this issue.

7. REPORT OF THE TREASURER:

See page 47, this issue.

On request of the Treasurer it was

Voted: That the President appoint auditors to examine and certify the treasurer's report.

J. T. Finneran and L. Brett, of Columbia University, were appointed as auditors.

8. REPORT OF ALUMNI COMMITTEE:

The Alumni Committee reported receipts and disbursements of the funds for grants-in-aid as follows:

Number of contributors.....	600 (approx.)
Amount contributed	\$2,222.62
Amount distributed	1,800.00

There were twenty-one applications for grants-in-aid. Eleven grants were made. Of the remaining ten, two applicants withdrew their application before the committee acted; one application was not accompanied by any supporting letters; one application was from an undergraduate in a mid-west institution who had not done any research work, had no project, and no purpose; two applications were in the field of psychology, and one of the members of the committee—Professor Shapley—secured grants for them from another source; the remaining four were in fields of work in which Sigma Xi does not support research.

It will thus be seen that grants were made to all the applicants who met the conditions of our grants, and the sum granted was the amount asked for in all cases except one—namely, that of Doctor Scott from Lehigh. After Doctor Scott had filed his application, the Bethlehem Steel Corporation had agreed to supply him with steel from which to make his large magnet, and hence he did not need from Sigma Xi the total sum originally asked.

The report of the Committee on Award of grants-in-aid appeared in full in the September issue of the *QUARTERLY*.

9. REPORT OF THE SEMI-CENTENNIAL COMMITTEE:

This report appears as part of the report of the president for 1935.

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10. REPORT OF THE COMMITTEE OF AWARD OF CERTIFICATES IN COMMENDATION OF RESEARCH :

This report appears as part of the report of the president for 1935.

The engrossed certificates were on exhibition during the Convention.

11. PETITIONS FOR CHARTERS FOR CHAPTERS :

- a. *The Executive Committee* presented to the Convention a formal printed petition for a charter for a chapter at Carleton College, Northfield, Minn., with a recommendation to favorable action.

Upon roll call, forty-five chapters voted in favor of granting the petition, and the delegations from six chapters announced that they were without instructions. One chapter reported by the Credentials Committee as represented did not vote.

The president declared the petition for a charter for a chapter at Carleton College was granted.

b. *The University of Buffalo:*

The Executive Committee presented to the Convention a formal printed petition for a charter for a chapter at the University of Buffalo, with a recommendation to favorable action.

Upon roll call, forty-five chapters voted in favor of granting the petition, and delegates from five chapters announced that they were without instructions. Two chapters reported as represented at the Convention did not vote.

The president declared the petition for a charter for a chapter at the University of Buffalo was granted.

(Note: Prior to the presentation of these two petitions, the secretary stated that, upon the authority of the Executive Committee, copies of the petitions had been sent to all the chapter secretaries. This was a departure from the practice of previous years, when neither chapters nor delegates saw the petitions until they were actually presented to the Convention. Delegates from six chapters stated that the copies of the petitions had not been received.)

12. SPECIAL COMMUNICATIONS :

The secretary read a letter from the president of the Sigma Xi Club of Peiping, China, announcing the appointment of Dr. W. B. Adolph, professor of biochemistry at Yenching University, as the representative of the club at the Convention.

The following letter from Doctor Adolph was read:

"I chance to be on sabbatical leave this year in United States of America and had hoped to attend the St. Louis meeting of the A. A. S. next week, and at the same time to attend the meeting of Sigma Xi, so that I might formally pay the respects of the Sigma Xi Club of

Peking. I regret however to find that I cannot now get away from New Haven.

"Instead, therefore, I am writing you this note to convey herewith the greetings from the Sigma Xi group in Peking. We continue in our enthusiasm for the aims and ideals for which Sigma Xi stands. The distance which separates Peking from America prevents our membership being represented in person at Sigma Xi conclaves. Be assured, however, that we may be counted upon as zealous supporters of the cause."

The secretary announced that D. A. Kohr, President of the Lowe Brothers Company, manufacturers of paints and varnishes in Dayton, Ohio, elected to Sigma Xi by the Ohio Chapter in 1900, had in the last two years purchased Sigma Xi emblems as gifts from the company to three individuals on their research staff. Mr. Kohr writes: "For a long time I was the only one in the organization who carried a Sigma Xi key, and I have enjoyed the opportunity of putting our younger men in position to share this pleasure with me."

13. IMPROVEMENT IN DIPLOMAS FOR MEMBERS AND ASSOCIATES:

The diplomas at present in use are made of a light paper with rough surface, which takes printing well, but is not adapted to engrossing. Acting upon suggestions from some of the chapters, the Executive Committee at its spring meeting authorized the Secretary to arrange for improvement on these diplomas if it could be done without too great additional expense to the chapters. The Secretary announced that hereafter the diplomas would be printed on a Japanese parchment with smooth surface, and that the new diplomas could be distributed to chapters at 10 cents each instead of nine cents, the price of the present style.

14. ASSESSMENT FOR 1936:

The treasurer presented the following resolutions:

Resolved: That the annual assessment on each chapter for 1936 shall be payable on January 1, 1936, and that the amount of the assessment on each chapter shall be 75c. multiplied by the number of members and associates of the chapter on January 1, 1936.

Resolved Further: That in sending notice of the 1936 assessment to chapter treasurers, the Treasurer of the Society be instructed to advise each chapter that the assessment is to be computed strictly on the basis of the number of members and associates on the membership roll of the chapter, without regard to whether said members have or have not paid current chapter dues, and to explain that this method of fixing the amount of the assessment on each chapter has been adopted by the Conventions of the Society as the most equitable to all chapters.

The Convention voted unanimously to approve the resolutions.

In this connection, discussion arose as to the status in the chapter of Sigma Xi members and associates who did not pay chapter dues. Attention

PROCEEDINGS OF THIRTY-SIXTH CONVENTION 39

was called to Section 1(b) of Article IX of the National Constitution, which reads as follows:

"Any chapter member or chapter associate in arrears for one year shall be duly notified of this fact by the treasurer of the chapter, and in event of failure to respond within six weeks may be suspended from chapter membership. On payment of arrearage he may be reinstated by vote of the chapter. If such reinstatement is not effected within one year his name shall be deleted from the rolls of the chapter, which action shall automatically place him in the class of Alumni members or associates."

15. REPORT OF COMMITTEE ON NOMINATIONS:

The Committee on Nomination of Officers consisted of Joseph K. Roberts, University of Virginia, chairman; Walter L. Upson, Washington University; and B. F. Kingsbury, Cornell University.

The report was presented by Professor Upson, as follows:

W. F. Durand, Leland Stanford, President.

Edward Ellery, Union College, Secretary.

George B. Pegram, Columbia University, Treasurer.

R. A. Gortner, University of Minnesota, Member of the Executive Committee.

F. B. Utley, Yale '03, Pittsburgh, Member of the Alumni Committee.

It was

Voted: That the secretary cast a ballot for the officers as named.

The president announced the election of the officers as named.

16. THE FOURTEENTH ANNUAL SIGMA XI LECTURE:

The president announced that the Fourteenth Annual Lecture under the joint auspices of the A. A. A. S. and Sigma Xi would be given in the Municipal Auditorium by John Bellamy Taylor of the General Electric Company, on "The Electric Eye and the Human Eye."

17. ADJOURNMENT:

The Convention adjourned at 5.45 P.M.

EDWARD ELLERY, *Secretary.*

REPORT OF THE PRESIDENT FOR 1935

1. NEW CHAPTERS:

Following the favorable action on petitions for chapters taken at the Thirty-fifth Convention of our Society held in Pittsburgh, December 28, 1934, two chapters have been added to the Sigma Xi National Organization during the year—the Wesleyan Chapter, established at Wesleyan University, Middletown, Conn., April 25; and the Smith Chapter, installed at Smith College, Northampton, Mass., May 1. President Parker and Secretary Ellery were the installation officers in both cases. The installation address at Wesleyan was given by President James Bryan Conant of Harvard University on "Science and the Humanities." At Smith, Professor Harold Clayton Urey of Columbia University gave the installation address on "Isotopes and Their Significance."

Our Society numbers now sixty-six chapters, with a total enrollment of over 12,500 members and associates.

There are thirty-five Sigma Xi clubs, many of them active in promoting research in the institutions with which they are connected. The membership of a Sigma Xi club is limited to those who are already members and associates of the Society, and a few years ago the Executive Committee invited the clubs to send representatives to the National Convention. At the Conventions the privileges of the floor, without the right to vote, are granted such delegates.

As pointed out in my report for 1934, the time has come for a fuller recognition of the clubs by the Society, and for a definite statement of their relation to the National Organization in our constitution. This will explain one of the amendments to the constitution to be presented later.

It is proposed to give space in the *Half Century Record and History* to the history of the activities of each Sigma Xi club.

2. PETITIONS FOR CHARTERS FOR CHAPTERS:

The Executive Committee will present to you later in the Convention two formal printed petitions for charters for chapters, with a recommendation for favorable action—one from Carleton College in Northfield, Minn., and one from the University of Buffalo. Both institutions have been under consideration by the Executive Committee for some time, both have been visited by officially appointed visitors who have made personal survey of the resources, equipment, and research in progress, and submitted carefully prepared reports of their findings. As a result of this intimate scrutiny of the existing conditions at the institutions, and of the conviction that the prospects of their continued output of worthy research work are promising, the Executive Committee feels confident that the Society will do well to grant these petitions. The Committee is prepared to answer questions about

the institutions, if delegates care to ask them, when the petitions come up for action.

3. POSSIBLE FUTURE PETITIONS FOR CHARTERS FOR CHAPTERS:

The Executive Committee has under consideration at the present time informal inquiries from five institutions in different parts of the country. If after careful study of the existing conditions in the scientific work at these colleges and universities the situation seems favorable, they will be subject to the same close investigation that the policy of the Society prescribes before any recommendation to the National Convention can be made. It is possible that the Thirty-seventh Convention may be asked to take action on a petition from some of these institutions. Delegates here today may assure their respective chapters that no recommendations in connection with petitions for chapters are made to the Convention without a long and careful study. It is only after it is convinced that the granting of a charter for a chapter will further the object of the Society—namely, the promotion of research—that the committee comes to the Convention with the petition.

4. CERTIFICATES IN COMMENDATION OF RESEARCH:

This year theses and scholastic records of thirty-five students from six institutions were presented in competition for the Society's certificates in commendation of research. The task of reading those theses and scrutinizing the scholastic record of the candidates was a considerable one, and required several months. The chairman of the committee of award was Prof. Kirtley F. Mather, of Harvard University, and associated with him were seventeen members of the instruction staffs of Harvard University and the Harvard Medical School: Reid Hunt, Hans Zinsser, Lionel S. Marks, Alfred C. Redfield, O. E. Sette, C. T. Brues, Frederick L. Hisaw, F. H. Crawford, Frederick A. Saunders, G. H. Parker, E. P. Kohler and colleagues in chemistry, Otto Bessey, M. O. Lee, Allan Grafflin, Harry C. Trimble, E. E. Tyzzer, and John H. Welsh.

Seventeen awards were made, as follows:

1. Low Temperature Carbonization of Coal, Anderson, University of Utah.
2. The Present Status of the Recapitulation Theory, Lucile Rogers Marshall, University of Utah.
3. Quantitative Study of the Bottom Fauna in Some Utah Streams Various Affected by Erosion, Moffett, University of Utah.
4. Cultural and Biological Characteristics of a Non-acid-fast Organism Isolated from Skin Lesions of Tuberculin Reacting Cattle, Nebeker, University of Utah.
5. Effect of Spaying on Body Growth and the Organ Weights of the Albino Rat, Billeter, University of Utah.
6. Parasites and Diseases of the Trout of Yellowstone Lake, Woodbury, University of Utah.
7. Two New Species of Tachygonetria from the Desert Tortoise, Peterson, University of Utah.

8. Bacteriological Study of the So-called "Skin Lesion of Tuberculin Reacting Cattle," Austin, University of Utah.
9. Determination of the Extent of Anactomosis in the Vascular System of Certain Crustacea by Means of Mercuric Sulphide and Methyl Salicylate, Herman F. Geske, Marquette University.
10. Preparation and Properties of Red Squill Extracts, Robert Edward Buck, Massachusetts State College.
11. Dissolved Iron as a Means of Separating Escherichia Coli and Aerobacter Aerogenes, Adam V. Syrocki, Massachusetts State College.
12. The Preparation of Some Alkylaminoguanidines, Gardner W. Kirsten, Brooklyn Polytechnic Institute.
13. The Change in the Position and the Morphology of the Golgi Apparatus in Relation to the Secretion of the Colloid in the Thyroid Gland of the Embryonic Albino Rat, Meliha Djedvet-Inay, Wellesley College.
14. Goiter Produced in the Albino Rat; Its Effect on the Basal Metabolic Rate, Marca Isabel Taliaferro, Wellesley College.
15. The Relation Between Absorption and Rotary Dispersion, Marguerite Naps, Wellesley College.
16. A Group Study of the Biological Value of Carotene, Ella M. Uhler, Wellesley College.
17. A Study of the Tautomeric Equilibria of Nitroso Naphthols and Naphthoquinoneoximes, Dorothy Jane Perkins, Wellesley College.

5. THE SEMI-CENTENNIAL PROGRAM:

The program of this important event in the history of our Society is as follows:

Friday Afternoon, June 19

- a. Greetings from Cornell University.
- b. Response from the President of Sigma Xi.
- c. A brief history of Sigma Xi.
- d. Address: The Service of Sigma Xi in the Universities of the Future—President Karl T. Compton, Massachusetts Institute of Technology.

Friday Evening, June 19

- a. The Semi-Centennial Dinner.
- b. Address: Scientific Research and the Social Order, Present and Future.*

Saturday Morning, June 20

- a. Unveiling the Semi-Centennial Memorial Tablet.
- b. Address: Accomplishments and the Future of the Physical Sciences—Dr. Willis R. Whitney, Vice-President of the General Electric Company, in charge of research.

* The speaker for the Friday evening program will be announced later. (Since the convention, Dr. Max Mason has accepted an invitation to give this address.)

- c. Address: Accomplishments and the Future of the Biological Sciences—
Prof. Frank R. Lillie, University of Chicago.
d. Presentation of the Semi-Centennial Research Awards.

Of the ten founders of Sigma Xi, six are still living, and will be the honorary guests of the Society during the celebration. They are: William Asher Day, John Knickerbacker, William Addams Moss crop, William Herman Riley, Frank Van Vleck, and Charles Benjamin Wing.

A son of Henry Shaler Williams, one of the deceased founders resides in New York City, and will also be an honorary guest of the Society. Efforts are being made to get in touch with the families of the other deceased members, in order that representation of the founders at the Semi-Centennial may be complete.

6. THE SEMI-CENTENNIAL RESEARCH AWARDS:

An important part of the Semi-Centennial celebration will be the award of two research prizes of \$1,000 each, one for work in the physical sciences, and one for work in the life sciences. Chapters and clubs have been asked to name a candidate for each of these prizes. The awards will be made by a special committee appointed for the purpose. The members of the committee are: Prof. Harold C. Urey, Columbia University, chairman; Dr. W. B. Castle of the Harvard Medical School, Dean J. W. Barker of Columbia, Prof. George Baitsell of Yale, and Prof. Edward Condon of Princeton.

7. THE ALUMNI COMMITTEE:

This committee represents over 15,000 members and associates of Sigma Xi scattered all over the world, and comprises an important adjunct to the various activities of the Society. From it, later in the Convention, will come valuable suggestions.

8. THE NATIONAL OFFICERS:

The members of the Executive Committee have a full realization of the importance of Sigma Xi in the scientific activities of educational and research institutions, and give generously of their time and thought to the conduct of the Society's affairs. At the spring meeting of the committee, fifteen separate items of business were considered, each of which comprised several distinct sub-items. For example, under the item of formal and informal petitions for charters for chapters, conditions at nine institutions were considered; the alumni committee presented four important recommendations; the possibility of lectures at our chapters subsidized by the national organization, and of their publication, was studied. At the meeting of the committee just prior to this Convention, nineteen distinct matters of business were considered.

Chapters and clubs are urgently requested to send to the National Secretary constructive comments about the activities of the Society. All suggestions so made will be presented to the Executive Committee at either the spring or the December meeting, or both.

GEORGE HOWARD PARKER, *President*.

REPORT OF THE SECRETARY FOR 1935

The routine activities of the secretary's office expand constantly with the uninterrupted growth of the Society in chapters and in numbers of members and associates. This is natural and desirable and gratifying. In 1922, when the present secretary assumed office, there were thirty-four chapters and no clubs. Today there are sixty-six chapters and thirty-five clubs. The enrollment of the chapters in 1922 was approximately 3,000. Today it is over 12,000. There was a single file of members in the secretary's office, namely, the chapter file. Today there are three files, namely, a chapter file, an alphabetical file, and a geographical file, not only of the 12,000 actively associated with chapters, but of the 15,000 more who are scattered all over the world. In 1922 the address list for the *QUARTERLY*, consisting of about 3,000 names, was maintained in the plant of the publisher. The circulation for the December issue this year was over 12,500, and the address list is in the office of the secretary, and the wrappers for each issue are run off on the addressograph machine there.

It is almost impossible to keep the address list for the *QUARTERLY* correct with an inadequate clerical staff. The enrollment of chapters naturally changes with the beginning of each academic year. Notices of these changes cannot be sent to the secretary's office until after chapters are organized each fall—in many instances not until December, or even January. In some cases the secretary never gets an enrollment list.

The only thing that can be done in the circumstances is to continue the use of the old lists until new lists are received.

Again, the record cards of newly elected members and associates are sent us usually in the spring or early summer, and many of them give the name of the institution as the initiates' mailing address. It has long been the policy of the society to send the *QUARTERLY* for one year to each new member and associate, but most of them leave the institution in the June following their election, and the address on file in the secretary's office is not correct.

We do not always get record cards for new members and associates. This does not affect our mailing list, but it leaves our files seriously incomplete. As soon as possible after the record cards are received we make a record card for our alphabetical file, and a stencil for the geographical file.

For these two causes the number of returns from the September issue is very large (approximately 600)—so large that we cannot get our address list completely corrected before the middle of November, when we must prepare the wrappers for the December issue.

Some of this difficulty would be avoided if the record cards for new members and associates gave the residence address of the individual, or some other address where mail would be delivered. The way out of the first named difficulty is not apparent at present.

Again, the demands on the secretary's office increase as the activities of the Society expand. Formerly these activities were limited to chapter business and the *QUARTERLY*. To these has been added: (1) the control by the Society of the sale of its insignia (1,275 orders during 1935), each one of which is acknowledged to the purchaser at the time the order is sent the official jeweler:

(2) the alumni movement—once a year a letter is sent to every one of the 15,000 and more members and associates who are not connected with a chapter (approximately 600 contributors this year, with a total received of \$2,222.62); (3) the grants-in-aid of research—entailing correspondence with intending applicants; (4) the certificates in commendation of research, awarded to students for work in science in institutions where the Society has no chapter—again involving a great deal of correspondence.

THE HALF-CENTURY HISTORY AND RECORD

In connection with the Semi-centennial it has been decided to issue a Half Century Record and History uniform with the Quarter Century Record and History published in 1911. Since April the secretary's office has been at work gathering the material for this volume. Chapter secretaries and alumni recorders of the institutions where we have chapters have been asked to supply us with the last known address of those individuals on record in the permanent files as having been elected by their respective groups. The secretary's office has prepared typed lists of all members and associates whose names are on the Society's records (over 27,000 names), and has sent them to the various institutions. Cooperation of the chapter secretaries and alumni recorders has been splendid.

With the sympathetic cooperation of all our chapters, we can have the Half Century History and Record ready for distribution when the Society gathers for the celebration in Ithaca, June 19 and 20.

EDWARD ELLERY, *Secretary*.

THE FOURTEENTH ANNUAL SIGMA XI LECTURE

Since 1931, the second of the general evening lectures of the Convention week of the A. A. A. S. has been given under the joint auspices of the Association and the Society of the Sigma Xi. At St. Louis, the lecture was delivered by John Bellamy Taylor, of the General Electric Company, on "The Electric Eye and the Human Eye." Mr. Taylor's thesis was that the sense of sight in the human being responded to the influence of radiant energy in the form of light, rather than, as is the case with the other human senses, to actual contact with matters; that a closed glass receptacle containing among other elements a metal plate coated with thin layers of the alkali metals is likewise sensitive to radiant energy, and when so affected the resulting phenomena are as interesting and impressive and useful as when the retina of the human eye responds to light stimulus. The lecture was accompanied by brilliant demonstrations in which the lecturer made use of special pieces of apparatus devised and constructed in the Research Laboratory of the General Electric Company.

The lecture was a brilliant contribution to the meetings of the week, and was attended by a large and interested and enthusiastic audience.

REPORT OF THE TREASURER

The 1935 assessments of all chapters, except Cornell University, University of Illinois, and Lehigh University, were paid within the year. (These chapters paid just after the end of the fiscal year.)

RECEIPTS

Cash on hand, December 31, 1934.....	\$ 4,702.04
Chapter assessments for 1935.....	6,506.21
Chapter assessments for 1934, arrears.....	281.25
Chapter assessments for 1936, advance.....	134.25
Overpayments	7.75
Initiation fees for 1935.....	2,283.96
Initiation fees for 1934, arrears.....	171.47
Installation fees	100.00
Interest on investments.....	947.00
Sale of insignia.....	1,050.00
Sale of New York Central 6% bond.....	1,000.00
Sale of Pacific Gas & Electric Co. 5½% bond.....	1,050.00
Sale of Western Electric Co. 5% bond.....	1,050.00
	<hr/> \$19,283.93

DISBURSEMENTS

Secretary's office (total, \$4,339.08)	
Assistants	\$ 2,265.60
Office, supplies, stamps, etc.....	273.48
Secretary's stipend	1,800.00
Treasurer's office (total, \$177.12)	
Assistant	150.00
Auditing 1934 books.....	10.00
Postage, etc.	17.12
Officers' traveling expenses.....	585.03
Quarterly (four issues).....	1,739.73
Engrossing charters	80.86
Special Centennial Fund.....	966.45
Loaned to Alumni Fund.....	349.53
Check tax28
Cash on hand, December 31, 1935.....	11,045.85
	<hr/> \$19,283.93

REPORT OF THE TREASURER

47

ALUMNI FUND

RECEIPTS

Cash on hand, December 31, 1934.....	\$ 337.95
Receipts from subscriptions	925.52
Interest	90.00
Borrowed from General Fund.....	349.53
	—————\$ 1,703.00

DISBURSEMENTS

Research:

F. E. Schmidt (1934-35)	\$ 50.00
T. L. Smith (1935-36).....	200.00
Abraham Smith (1935-36).....	100.00
Frederic A. Smith (1935-36).....	300.00
Duncan Stewart (1935-36).....	200.00
C. O. Schwartz and J. H. Parker (1935-36).....	100.00
W. J. Luyten (1935-36).....	100.00
F. E. Schmidt (1935-36).....	50.00
Everett Thatcher (1935-36).....	250.00
E. C. Dale (1935-36).....	100.00
L. B. Clark (1935-36).....	250.00

—————\$ 1,700.00

Check returned, 1934..... 3.00

Cash on hand, December 31, 1935..... 000.00

—————\$ 1,703.00

INVESTMENT ACCOUNT—ALUMNI FUND

(Securities carried at cost)

\$1,000 Southern Pacific Co. 4½% bond at.....	\$ 905.75
\$1,000 Southern Pacific Co. 4½% bond at.....	907.00
	—————\$ 1,812.75

December 31, 1935.

GEORGE B. PEGRAM, *Treasurer.*

INVESTMENT ACCOUNT—GENERAL

(Securities carried at cost)

All the companies continue to pay interest on their bonds except the St. Louis and San Francisco Railway, which is in receivership.

\$1,000 Amer. Tel. & Tel. 5½% (1943) bond at.....	\$ 991.94
\$1,000 Consolidated Gas of New York 5½% (1945) bond at	1,002.90
\$1,000 St. Louis & San Francisco Railway 4% (1950) bond (certificate of deposit) at.....	796.35
\$1,000 Baltimore & Ohio Railway 5% (2000) bond at.....	955.00
\$1,000 Philadelphia Company 5% (1967) bond at.....	979.50

\$1,000 Erie Railroad Co. 5% (1967) bond at.....	947.00
\$1,000 Southern Railway Co. 6% (1956) bond at.....	1,152.00
\$1,000 Philadelphia Company 5% (1967) bond at.....	997.55
\$1,000 Canadian Pacific 5% (1954) bond at.....	1,010.00
\$1,000 U. S. Treasury 4% (1954) bond at.....	999.06
\$1,000 U. S. Treasury 3% (1955) bond at.....	942.50
\$1,000 U. S. Treasury 3% (1955) bond at.....	942.50
\$1,000 U. S. Treasury 3% (1955) bond at.....	942.50
\$1,000 U. S. Treasury 2½% (1939) bond at.....	1,019.37½
\$1,000 U. S. Treasury 2½% (1939) bond at.....	1,019.37½
\$1,000 U. S. Treasury 2½% (1939) bond at.....	1,019.37½
\$1,000 U. S. Treasury 2½% (1939) bond at.....	1,019.37½
\$1,000 U. S. Treasury 2½% (1939) bond at.....	1,019.37½
\$1,000 U. S. Treasury 2½% (1939) bond at.....	1,019.37½
\$200 New York City (1935) bond at.....	198.50
\$200 New York City (1936) bond at.....	198.50
\$200 New York City (1937) bond at.....	198.50
\$200 New York City (1938) bond at.....	198.50
\$200 New York City (1939) bond at.....	198.50
\$200 New York City (1940) bond at.....	198.50
\$200 New York City (1941) bond at.....	198.50
\$200 New York City (1942) bond at.....	198.50
\$200 New York City (1943) bond at.....	198.50
\$1,000 U. S. Treasury 3% (1938) bond at.....	1,034.03
\$1,000 U. S. Treasury 3% (1938) bond at.....	1,034.03
\$1,000 U. S. Treasury 3% (1938) bond at.....	1,034.03
<hr/> \$23,663.09	

We have audited the accounts of the Treasurer of the Society of Sigma Xi for the year ending December 31, 1935, and certify that the income shown by the books of the Treasurer has been duly accounted for, that payments have been properly vouchered and that the balance sheet and accounts submitted contain a true statement of the financial condition of the Society. We have also examined the securities in the hands of the Treasurer and find the following bonds: \$1,000 Amer. Tel. & Tel.; \$1,000 Consolidated Gas of New York; \$1,000 St. Louis & San Francisco Railway (certificate of deposit); \$1,000 Baltimore & Ohio Railway; \$1,000 Philadelphia Co.; \$1,000 Erie Railroad; \$1,000 Southern Railway; \$1,000 Philadelphia Co.; \$1,000 Canadian Pacific; \$1,000 U. S. Treasury; \$1,000 U. S. Treasury; \$1,000 U. S. Treasury; \$1,000 U. S. Treasury; \$1,000 U. S. Treasury; \$1,000 U. S. Treasury; \$1,000 U. S. Treasury; \$1,000 U. S. Treasury; \$1,000 U. S. Treasury; \$200 New York City; \$200 New York City; \$200 New York City; \$200 New York City; \$200 New York City; \$200 New York City; \$200 New York City; \$200 New York City; \$1,000 U. S. Treasury; \$1,000 U. S. Treasury; \$1,000 U. S. Treasury; \$1,000 Southern Pacific; \$1,000 Southern Pacific.

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DIPLOMAS FOR MEMBERS AND ASSOCIATES

These diplomas are available in any quantity at 10 cents each. Orders should be sent to the National Secretary, should specify whether for members or associates, and should be accompanied by check.

INDEX CARDS

Index cards for newly elected members and associates are available *gratis* upon requisition from chapter secretaries to the National Secretary. These cards should be made out in duplicate, one set being retained for chapter files and one set being sent to the National Secretary for filing in the permanent records of the national organization.

NATIONAL CONSTITUTION

Printed copies of the National Constitution, containing all amendments to date, and all recent interpretations as made by the national officers on request of chapters, are available at 9 cents each from the National Secretary.

CHANGES OF ADDRESSES

Chapter secretaries are asked to send to the National Secretary in October of each year changes in their enrollment lists as follows: 1. Names and addresses to be deleted from the previous list; 2. Names and addresses to be added to previous list; 3. Changes of addresses of those on previous list who may have moved to a new address since the list was submitted.

EDWARD ELLERY,
National Secretary, Sigma Xi,
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Schenectady, N. Y.